

## A REVIEW OF THE MANGROVE GOBY GENUS *HEMIGOBIUS* (GOBIOIDEI, GOBIIDAE, GOBIONELLINAE)

HELEN K. LARSON

Museum and Art Gallery of the Northern Territory

PO Box 4646, Darwin NT 0801, AUSTRALIA

(e-mail: helen.larson@nt.gov.au)

### ABSTRACT

The gobiid fish genus *Hemigobius* is reviewed and found to comprise two species, which are redescribed. The genus is considered to belong to the subfamily Gobionellinae, is closely related to the genera *Mugilogobius* and *Pseudogobius*, and can be distinguished from them by a combination of characters. *Hemigobius* is restricted to mangrove habitats in northern Australia and South-east Asia.

**KEYWORDS:** Gobioidae, Gobiidae, Gobionellinae, *Hemigobius*, mangroves, northern Australia, South-east Asia.

### INTRODUCTION

The gobiid fish genus *Hemigobius* Bleeker, 1874, consists of six nominal species, which have been variously placed in *Hemigobius*, *Mugilogobius* or *Pseudogobius*. The generic name apparently has not been used other than in Koumans (1931, 1953), Miller (1987), Kottelat *et al.* (1993) and Larson (1995; in press).

Bleeker (1874) placed his new genus '*Hemigobius*' in the group Subphalanx Eugobii, in which he put most of the gobiid genera comprising his Phalanx Gobiini. He characterised *Hemigobius* by the truncate teeth of its type species, *Gobius melanurus* Bleeker.

Koumans (1931: 101) erected the genus *Microgobius* (non Poey), based on Bleeker's "museum name" written on the bottles of two species at Leiden museum (RMNH), and listed it as a junior synonym of *Stigmatogobius* Bleeker (along with *Pseudogobius*, given as another Bleeker museum name). Koumans included under *Microgobius* non Poey: *Gobius hoevenii* Bleeker, 1851, and *Gobius tambujon* Bleeker, 1854, based on Bleeker's jar labels. Koumans indicated that the latter two species were probably *Stigmatogobius*, but

were "... too badly preserved to decide it with certainty" (1931: 102). The holotype of *Gobius hoevenii* (RMNH 4457) is a valid species of *Hemigobius*, redescribed below. Three probable syntypes of *Gobius tambujon* (RMNH 4458) are *Redigobius* species (Larson, in prep.).

Fowler (1940) erected the genus *Sphenentogobius*, for his new species *vauverbilti*. He remarked upon the elevated rear ramus of the mandible, and the etymology of his genus *Sphenentogobius* reflects this: "σφην wedge + εντοζ within + Gobius". He considered *Sphenentogobius* to be "apparently related to *Redigobius*".

During revision of the gobiid fish genus *Mugilogobius* Smitt and its nominal relatives in the subfamily Gobionellinae (Larson 1995; Larson in press), *Hemigobius* Bleeker was found to be most closely related to *Pseudogobius*.

*Hemigobius* and *Pseudogobius* group together due to their derived fifth ceratobranchial, lip and gut morphology, mouth position and abbreviate headpore patterns (they both lack preopercular pores and the rear part of oculoscapular canal, but headpores are always present) (Larson in prep.). Each genus has an autapomorphic long gut coiling pattern, differing from most

of the *Mugilogobius* group of genera. *Hemigobius* has a long coiled gut reminiscent of *Chlamydogobius* (Larson 1995; in press). The gut morphology of *Pseudogobius* resembles a short version of that in *Awaous* (Geevarghese 1983; Larson in press). Other related genera have short, typically "carnivorous goby" gut forms. *Hemigobius* has 17 segmented caudal rays, while *Pseudogobius* has 16. *Pseudogobius* has two *s* papillae rows on the snout, and *Hemigobius* has three, as in *Mugilogobius*. *Hemigobius* has the fine villi on the head characteristic of *Mugilogobius*, while *Pseudogobius* does not possess them.

Miller (1987) was in error when he stated that *Hemigobius* lacked head canals. The author assumes that Miller made this statement on the basis of his examination of the type of *Gobius melanurus* Bleeker, 1849 (which is also the type of *Hemigobius bleekeri* Koumans, 1953), the only material of this genus referred to in his paper (Miller 1987). This specimen (RMNH 4501) has badly abraded skin covering the very short canals, so that the headpores appear to be absent. However, the cheek scales, characteristically shaped dentary and flattened teeth are present. Examination of fresh specimens of this species revealed the canal and headpore arrangement characteristic of this genus. Miller apparently was not aware of the identity of *Gobius hoevenii* Bleeker, 1851, as he refers to *Hemigobius* as being monotypic (based on Koumans 1953). In the same paper, Miller erroneously included *Sphenentogobius* Fowler as a synonym of *Redigobius* (no reasons are given, although it is likely that he did so in agreement with Fowler's statement, in the original description of the genus, that it was related to *Redigobius*).

## METHODS

Measurements were taken using electronic callipers and dissecting microscope. Counts and methods generally follow Hubbs and Lagler (1970), except as indicated below. Papillae pattern terminology is based on that of Sanzo (1911), due to its use in previous literature

on this group of gobionellines by Aurich (1938) and Miller (1987, 1989). Pterygiophore formula follows Birdsong *et al.* (1988). Transverse scale counts are taken by counting the number of scale rows from the anal fin origin diagonally upward and back toward the second dorsal fin base. Head length is taken to the upper attachment of the opercular membrane. Interorbital width is least fleshy width (not least bony width). In the descriptions, an asterisk indicates counts of the holotype. Numbers in parentheses after counts indicate the number of specimens with that count, or the range of counts. Vertebral counts and other osteological information was obtained by radiography and clearing and double-staining.

Synonymies are not complete, as it was not always possible to determine from descriptions or illustrations what species was referred to in various publications (for example, *Stigmatogobius hoevenii* could be *Hemigobius hoevenii* or *Mugilogobius chulue*). Synonymies are given where the identity was verified by examination of specimens or the description was unequivocal.

Abbreviations for institutions referred to are: AMS - The Australian Museum, Sydney; ANSP - Academy of Natural Sciences, Philadelphia; BMNH - The Natural History Museum, London; CAS - California Academy of Sciences, San Francisco; CMK - Collection Maurice Kottelat, Cornol, Switzerland; KUMF - Kasetsart University Museum of Fisheries, Bangkok; NIFI - National Inland Fisheries Institute, Bangkok; RMNH - Nationaal Natuurhistorisches Museum, Leiden; NTM - Museum and Art Gallery of the Northern Territory, Darwin; URM - University of the Ryukyus, Naha; USNM - National Museum of Natural History, Washington; WAM - Western Australian Museum, Perth; ZMH - Zoologische Museum, Hamburg; ZRC - Zoological Reference Collection, University of Singapore; ZSM - Zoologische Staatssammlung, München.

Other abbreviations used: HL - head length; SL - standard length; TRB - transverse scale rows backward.

## SYSTEMATICS

*Hemigobius* Bleeker, 1874

*Hemigobius* Bleeker, 1874 (*Gobius melanurus* Bleeker, 1849: 31, Java; = *Hemigobius bleekeri* Koumans, 1953: 191, replacement name for *Gobius melanurus* Bleeker, by original designation and monotypy).

*Microgobius* Koumans, 1931 (listed as synonym of *Stigmatogobius*). Preoccupied by *Microgobius* Poey.

*Sphenentogobius* Fowler, 1940 (*S. vanderbilti* Fowler, 1940: 396, figs 8-11, Sumatra, by original designation and monotypy).

**Diagnosis.** Distinguished by following combination of characters. Second dorsal rays 1,6-8, modally 1,7; anal rays 1,6-9, modally 1,7; pectoral rays 13-17; 17 segmented caudal rays in 9/8 pattern; some headpores present with no lateral canal over preoperculum, no preopercular pores, no nasal pores, and pairs of interorbital pores not connecting across interorbital space; 25-34 lateral scales; circumpeduncular scales strongly modally 12; predorsal scales 7-12, extending close up to behind eyes, margins of anteriormost scales scalloped; preopercle at least partly scaled; interorbital and top of snout with fine villi; gill rakers without spines; papillose flaps or pads present at insertion of first gill arch onto roof of mouth; jaws small, lower jaw symphysis usually raised; thin, folded lower lip; teeth small and flattened in females (at least), usually conical in males; anterior nostril in short tube oriented down and forward over upper lip, preorbital usually curved outward slightly around base of nostril; genital papilla slender, flattened and pointed in males, conical and blunt-tipped in females; intestine very long and tightly coiled.

Dorsal pterygiophore formula 3-12210; two epurals, rarely one; one to three anal pterygiophores before haemal spine of first caudal vertebra; neural spine on first vertebra usually short and broad. Palatine and pterygoid short, with broad, T-shaped heads; palatine larger and more robust than pterygoid. Metapterygoid deep, well separated from quadrate, anterior process

extends upward and forward, well above quadrate. Mandibular ramus elevated and curved anteriorly in *H. mingi*, elevated but angled backward in *H. hoevenii*. Fifth ceratobranchials triangular, very open and lattice-like in structure.

Found in mangroves in Indo-west Pacific.

Key to species of *Hemigobius*

1. Pectoral rays 13-17, usually 15-16; body relatively slender, depth at anus about 4-5.5 times in SL; about six distinct diagonal bars along sides; first dorsal fin with two broad dark bands, not forming spot..... *H. hoevenii* (Bleeker, 1851) (Thailand, Hong Kong, Malaysia, Singapore, Philippines, Borneo, New Guinea, northern Australia)

1A. Pectoral rays 13-15, usually 14; body relatively deep, depth at anus about 3.5-4.5 in SL; scale margins outlined, forming reticulated pattern, with four or five indistinct dorsal saddles sometimes present; very distinct black spot posteriorly on first dorsal..... *H. mingi* (Herre, 1936) (Thailand, Singapore, Sumatra, Java)

*Hemigobius hoevenii* (Bleeker, 1851)

(Figs 1-6, Tables 1-4)

*Gobius hoevenii* Bleeker, 1851: 426-427 (Sambas, in river, Borneo).

*Vaimosa crassa* Herre, 1945: 403 (brook near Un Long, Hong Kong).

*Stigmatogobius hoevenii* - Koumans 1953: 125 (in part).

*Microgobius hoevenii* - Bleeker 1983: pl. 438, fig. 17.

*Mugilogobius obliquifasciata* Wu and Ni, 1985: 93-95 (Haikou, Hainan Island, China). - Anon. 1986: 272-273.

*Mugilogobius obliquifasciatus* - Zhu 1988: fig. 162.

*Hemigobius crassa* - Davis 1988: 164.

*Pseudogobius hoevenii* - Murphy 1990: 155.

*Mugilogobius latifrons* - Nguyen 1991: 334-335, fig. 143.

*Hemigobius hoevenii* - Kottelat *et al.* 1993: 146.

**Material examined.** 80 specimens (8.5-37). THAILAND: URM P.12662, 2(28-28), mangrove swamp at Phuket, H. Senou and V. Chavalit, 2 November 1983; ex URM P.6677, 3(22.5-25.5), Ranong, 9 March 1982. MALAYSIA: ZSM 27559, 4(23-26.5), mangrove at Bangangan, SW of Sandakan, Sabah, Kettner, Krumenacher and Witte, 13 March 1988. SINGAPORE: Paratype of *Vaimosa fusca*, CAS 32987, 25.5 mm SL male, mangrove swamp, Kranji River, A. Herre, March 1937. NTM S.14235-004, 11(8.5-27), Sungei Buloh mangroves, K. Lim, 30 January 1991. BRUNEI: NTM S.12812-002, 2(18-24), Kedalayan River, from *Nypa* leaf axils, R. Hanley and S. Choy, 7 April 1989. INDONESIA: Holotype of *Gobius hoevenii*, RMNH 4457, 32 mm SL female, in river, Sambas, Borneo. BMNH 1935.5.27.28, 1(36), (possibly from Sulawesi), Arnold. HONG KONG: Holotype of *Vaimosa crassa*, 35 mm SL female, CAS/SU 39848, Un Long, New Territories, A.W. Herre, 23 February 1941. PHILIPPINES: CAS 38636, 30(19-33), Coron, Busuanga, 22-30 June 1940, A.W. Herre. PAPUA NEW GUINEA: WAM P.26751-006, 2(21.5-37), Tureture village, Binaturi, G. Allen, 29 September 1979. AUSTRALIA: QUEENSLAND: AMS I.23262-001, 8(18-32), The Esplanade, Cairns, D. Hoese and D. Rennis, 2 October 1982. AUSTRALIA, NORTHERN TERRITORY: NTM S.11065-002, 13(13-21.5), Leanyer Swamp, Darwin, T. Davis, 5 March 1980. WESTERN AUSTRALIA: AMS I.25521-009, 1(27.5), Crab Creek, Broome, D. Hoese, D. Rennis, 20 September 1985.

*Other material examined (but not used in description).* 275 specimens from the following localities. HONG KONG: Paratype of *Vaimosa crassa*, CAS/SU 39849, 1, 35 mm SL. THAILAND: URM P.13336, 1, Khung Kraben Bay; \*NTM S.13953-014, 6, Klong Bang Sai, Phuket; URM P.13344, 2, Khung Kraben Bay; NTM S.14288-002, 6, Ta-Chalab. MALAYSIA: CAS 33168, 3, Kabili River, North Borneo. SINGAPORE: ZRC 20635-40, 6, Sungei Punggol; ZRC 20238-45, 8, Sungei Punggol; ZRC 27450, 1, Siglap Canal; ZRC 21084-

91, 8, Sungei Seletar; ZRC 21872-906, 35, Mandai Kecil; ZRC 20476-78, 3, Mandai mangroves; NTM S.13957-009, 35, Sungei Pandan; CMK 8223, 6, Kranji mangrove; CAS 40136, 8, Serangoon; ZRC 29185, 1, Sungei Buloh; NTM S.13968-008, 13, Sungei Pandan; NTM S.13959-012, 10, Sungei Buloh; NTM S.13961-007, 27, Mandai Kecil. BRUNEI: NTM S.13052-002, 1, Pulau Berembang. NTM S.13053-004, 2, Pulau Berembang. PHILIPPINES: USNM 99613, 1, Port Dupon; CAS 38637, 46, Panay, Capiz; CAS 26381, 1, Lake Buhi. INDONESIA: CMK 7265, 6, Tanjung Mayong, Padang, Sumatra. PAPUA NEW GUINEA: USNM 316170, 1, Daru. AUSTRALIA, NORTHERN TERRITORY: NTM S.10419-006, 2, Elizabeth River, Darwin Harbour; NTM S.10420-002, 1, Elizabeth River, Darwin Harbour; NTM S.11845-004, 1, Leanyer Swamp; NTM S.14289-001, 12, Leader's Creek, Gunn Point; NTM S.14290-002, 20, Leader's Creek, Gunn Point. NO DATA: RMNH 14049, 1.

**Diagnosis.** *Hemigobius* with body robust, compressed, with rounded, somewhat depressed head, snout rounded and overhanging upper lip; second dorsal rays 1,6-8 (modally 1,7); anal rays 1,6-7 (modally 1,7); pectoral rays 13-16; longitudinal scales 27-32; TRB 7-12; anteriormost predorsal scale largest, 8-10 scales, extending close up behind eyes; mouth enlarged in males; scales on body ctenoid; first dorsal fin low, rounded, with no filamentous spines; body greyish to brownish with six diagonal blackish bars across sides, marbled to ocellate black spot on caudal base, roughly vertical black line on opercle extending to underneath head; known from mangrove areas of the Indo-Malayan Archipelago, Papua New Guinea and northern Australia.

**Description.** Based on 40 specimens, 15-37 mm SL. Counts of holotype of *Gobius hoevenii* indicated by asterisk.

First dorsal VI\*: second dorsal 1,7-8 (mean 1,7\*); anal 1,7-9 (mean 1,7\*), pectoral rays 13-16\* (mean 16), segmented caudal rays always 17\*; caudal ray pattern 6/6 to 9/8 (modally 8/7\*); branched caudal rays 12-

**Table 1.** Frequency distribution of fin ray counts in *Hemigobius* species.

Species	Second dorsal rays			Anal rays				Pectoral rays				
	6	7	8	6	7	8	9	13	14	15	16	17
<i>hoevenii</i>	-	25	15	-	27	12	1	1	2	17	19	1
<i>mingi</i>	1	34	1	1	35	-	-	2	29	5	-	-

**Table 2.** Frequency distribution of longitudinal counts in *Hemigobius* species.

Species	25	26	27	28	29	30	31	32	33	34
<i>hoevenii</i>	2	3	10	4	2	6	5	6	1	1
<i>mingi</i>	-	-	4	4	17	9	1	1	-	-

**Table 3.** Frequency distribution of transverse backward scale counts in *Hemigobius* species.

Species	7	8	9	10	11	12
<i>hoevenii</i>	1	11	10	10	7	1
<i>mingi</i>	-	-	11	19	5	1

17 (modally 15, broken in holotype); unsegmented (procurrent) caudal rays 6/7 to 8/8 (modally 7/7); longitudinal scale count 25-32 (mean 29; 27 in holotype); TRB 7\*-12 (mean 10); predorsal scale count 8-10 (mean 9\*); circumpeduncular scales 12 (13 in one). Gill rakers on outer face of first arch 2+8 to 4+9 (modally 2+8). Dorsal pterygiophore formula 3-12210 (in 12). Vertebrae 10+16 (in nine), 10+17 (in one), 11+15 (in one), 11+16 (in one). Neural spine of first vertebra very short and broad, sharply bent posteriorly at halfway point (in 11). Two epurals (in 10) or one very broad epural (in two). Two (in two) or three (in 10) anal pterygiophores before haemal spine of first caudal vertebra. Lachrymal not enlarged, relatively slender.

Body approximately rounded anteriorly; compressed posteriorly. Head depressed, especially in mature males, width always greater than depth, cheeks may be inflated in males; profile blunt to rounded; nape often convex behind flattened broad interorbital,

HL 3.2-4.1 (mean 3.6) in SL. Depth at posterior preopercular margin 1.5-1.9 (mean 1.7) in HL. Width at posterior preopercular margin 1.2-1.5 (mean 1.3) in HL. Mouth terminal to subterminal, almost horizontal, with rounded snout overhanging upper lip; jaws forming angle of about 7-15° with body axis; jaws generally reaching at least to below anterior half of eye, and to rear edge of eye in large (sexually mature) males. Upper jaw 1.7-3.6 (mean 2.8) in HL; in males, 1.7-3.5 (mean 2.6); in females, 2.1-3.6 (mean 2.9) in SL. Upper lip narrow, smooth, without fleshy fimbriae; lower lip thin, reduced to narrow (mugilid-like) fold, free along posterior half of jaw, anterior half of lip fused to underside of head, lower lip fold often thicker and extending further forward in mature males; lower jaw slightly curved upward, in large specimens low ridge at symphysis sometimes present. Eyes large, dorsolateral, high on head, sometimes forming part of dorsal profile, 3.1-4.2 (mean 3.5) in HL. Snout rounded, inflated over top lip, 2.8-4.1 (mean 3.3) in HL. Interorbital broad, flat, 2.3-5.3 (mean 3.0) in HL. Top of head, from just behind eyes up to snout tip, often with fine villi, these sometimes relatively sparse on anteriormost nape scales (villi may only be visible in specimens with well-preserved mucous coat). Body often quite round in abdominal region in females, depth at anal origin 4.2-5.6 (mean 4.9) in SL. Caudal peduncle compressed, length 3.3-4.1 (mean 3.7) in SL. Caudal peduncle depth 5.5-7.9 (mean 6.9) in SL.

First dorsal fin low, rounded, tips of second to fourth spines free, second or third spines longest or subequal; spines always falling short of second dorsal fin origin when depressed. First dorsal spine always shorter than next three. Third dorsal spine length 5.1-13.2 (mean 7.6) in SL. Fourth dorsal spine length 6.3-10.0 (mean 7.8) in SL. Second dorsal and anal fins low, posteriormost rays usually longer than anteriormost, rays reaching more than halfway to caudal fin base when depressed. Pectoral fin short and rounded, central rays longest, 4.4-5.5 (mean 4.9) in SL; rays usually all branched but for uppermost. Pelvic fins short, rounded, reaching half (or

less) distance to anus, 4.9-6.8 (mean 5.7) in SL. Caudal fin round, 3.5-4.9 (mean 3.9) in SL.

No mental fraenum, chin smooth. Anterior nostril in short tube, placed just behind upper lip, tube oriented forward and down; preorbital straight, not curved to accommodate nostril. Posterior nostril oval, with or without low rim, placed about halfway between anterior margin of eye and edge of preorbital (usually slightly closer to eye). Gill opening narrow, usually extending from just beyond lower pectoral base forward to just under opercle. Inner edge of shoulder girdle smooth with no ridge or flange (in 16) or with low bony ridge or flange formed by partly exposed cleithrum (in 10), which may be bent laterally. Gill rakers on outer face of first arch very short, pointed and without spines, longest raker at angle of arch; several thin lobes or flaps on fleshy pads on roof of mouth just above first arch; rakers on inner face of first arch long and slender; outer rakers on second arch similar to, but smaller than, those on first arch; outer rakers on third and fourth arches very tiny or absent; inner rakers on second and third arches progressively longer and finer than first arch inner rakers; inner rakers of fourth arch small, fine and closely spaced. Tongue tip usually rounded, somewhat bilobed in northern Australian and Papua New Guinea specimens. Teeth in two rows in each jaw; tooth form differing between

males and females. In males, teeth in outer row of upper jaw enlarged, conical and curved (Fig. 1), row present across front of jaw only; inner row teeth small, conical, stout, blunt or pointed, extending whole length of jaw, inner teeth more widely spaced along sides of jaw than those crowded together across front. Lower jaw teeth in males stout, conical, slightly curved and pointed; teeth in both rows about equal in size but anteriormost two to four teeth in inner row usually enlarged and pointing backward; usually no teeth present on rear third to half of jaw. In females, both rows of upper jaw teeth very small, flattened, with blunt tips, teeth with tips bent to one side along side of jaw; both rows of teeth extending along entire length of jaw. Lower jaw teeth in females very small, curved and pointed; teeth slightly larger near median symphysis, teeth at side of jaw slightly increasing in size posteriorly, with posteriormost tooth considerably larger, stout and strongly curved.

Predorsal scales medium, largest scales anteriormost, scales reaching forward to close behind eyes; edge of first few predorsal scales often erenulate or scalloped (most conspicuous in larger specimens). Operculum covered with cycloid scales. Cheek below eye naked, often one to three scales on upper preopercle close behind eye. Pectoral base covered with cycloid scales. Prepelvic area covered with small cycloid

**Table 4.** Measurements (mm) of *Hemigobius hoevenii* (Bleeker, 1851).

Character	Holotype	Males Minimum	Males Maximum	Males Mean n = 18	Females Minimum	Females Maximum	Females Mean n = 22
Head Length	7.9	4.1	10.0	7.3	4.2	9.5	6.5
Head Depth	5.3	2.3	6.3	4.4	2.3	5.4	3.8
Head Width	6.3	3.1	8.0	5.7	3.1	7.2	5.0
Body Depth	7.0	2.7	8.6	5.4	3.1	7.4	4.8
Body Width	-	1.5	5.3	3.2	1.8	5.7	2.9
Caud. Ped. Length	8.6	4.5	10.6	7.1	3.8	9.3	6.3
Caud. Ped. Depth	5.4	1.9	6.5	3.9	2.0	5.4	3.4
Snout	-	1.1	3.3	2.3	1.2	3.1	1.9
Eye	2.5	1.2	3.0	2.1	1.3	2.9	1.9
Jaw	-	1.2	5.5	3.2	1.2	3.7	2.3
Interorbit	1.5	1.2	4.1	2.6	1.2	3.7	2.3
Pectoral	-	2.8	7.6	5.3	3.0	6.7	4.7
Pelvic	4.7	2.5	6.9	4.6	2.6	5.7	4.1
Caudal	-	3.8	10.2	6.7	4.1	7.7	5.8
Longest D1 spine	-	1.7	5.1	4.1	1.8	4.4	3.2

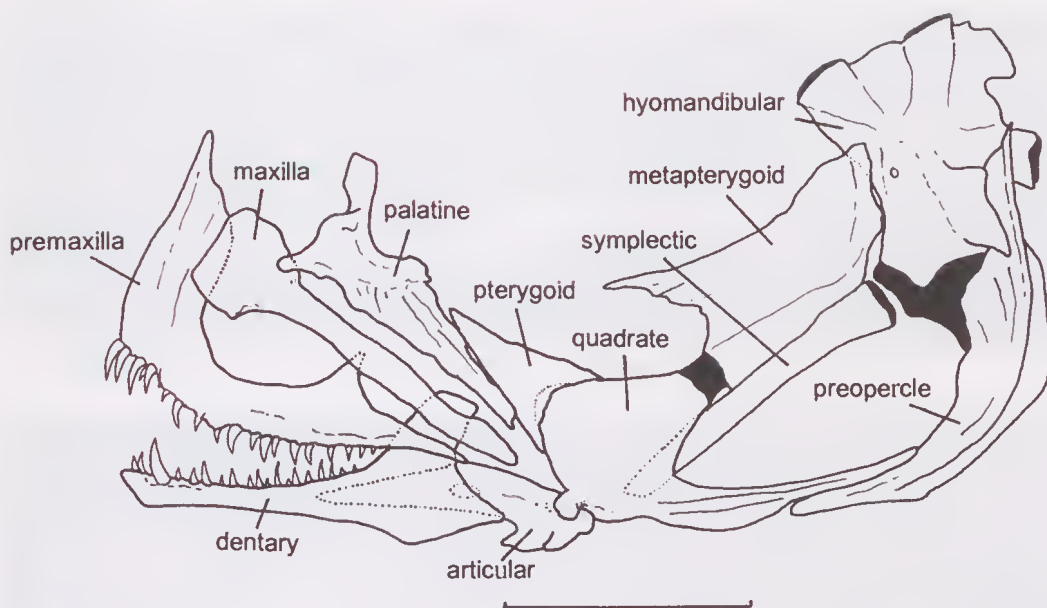


Fig. 1. Jaws and suspensorium of *Hemigobius hoevenii*, male, ex NTM S.11065-002, Leanyer Swamp, Northern Territory. Scale bar = 1 mm. Black areas are cartilage.

scales. Belly scales mostly cycloid, anterior half to third ctenoid. Body scales ctenoid up to pectoral base, ctenoid scales sometimes extending above posterior part of opercle.

Genital papilla in female short, rounded, slightly flattened toward blunt tip; papilla in male slender, elongate and flattened, narrowing toward pointed tip; small finger-like protrusion at tip may be present.

Head pores present, in reduced pattern (Fig. 2). Anterior and posterior interorbital pores paired; latter pair never joined by canal, always separate. Postorbital and infraorbital pores present. No preopercular pores. No lateral canal over preoperculum.

Sensory papillae pattern longitudinal, as in Figure 2. Papilla row *p* consisting of widely spaced papillae; row largely replaced by interorbital canal. Cheek papillae rows short; papillae rows rather broken-up, scattered, rows *a*, *cp* and *c* composed of few large papillae; rows *b* and *d* short, composed of small, close-set papillae. Preopercular margin papilla row *e* often broken up into short sections or pairs of papillae following margin. Three *s* rows present on snout, of one papilla each. Single *f* row papilla on each side of mandibular symphysis, behind lip (sometimes

row *i* extending up behind symphysis, so that four papillae appear to be present).

**Coloration of fresh material.** An illustration is given in Bleeker (1983: pl. 438, fig. 17; as *Microgobius hoevenii*) of this species. It shows the bands on the first dorsal fin, and the oblique blackish bars over lighter background (rather pinkish, with lower half of head yellow).

From colour photograph in Zhu (1988: fig. 162), identified as *Mugilogobius obliquifasciatus* Wu and Ni, of two *H. hoevenii* in an aquarium. Head and body greyish yellow to greyish pink, with dark brown oblique bars and other markings, edges of oblique bars quite black, darker than colour in bars' centres. Greyish pink streak, with brown streak on either side, extending from front of eye to upper jaw. Iris very dark brown. Ocellate black caudal spot surrounded by almost pinkish colour. Both dorsals translucent yellowish grey with blackish brown markings; second dorsal with broad transparent margin. Caudal fin translucent, with few brownish streaks along fin ray bases. Pectoral base with distinct black line near upper edge, and indistinct pinkish band along bases of fin rays.

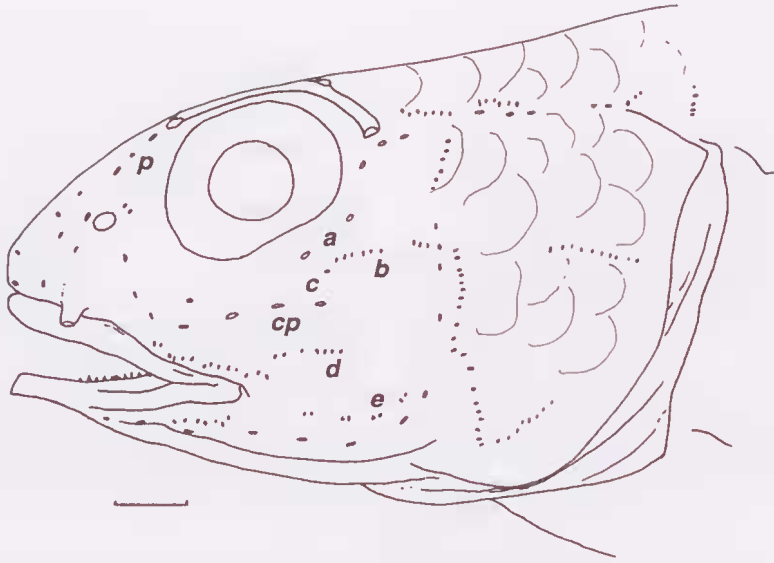


Fig. 2. *Hemigobius hoevenii* papillae pattern. CAS/SU 38636, Coron, Busuanga, Philippines. Scale bar = 1 mm.

Live specimens from Singapore mangroves noted (by author) as being mostly pinkish with dark brown bars and other markings. Lower half of body pale pinkish to pinkish brown, upper half light brown to pinkish. Pectoral fins yellowish with gold mark on ventral half of fin base. Chrome yellow area just above and anterior to black caudal base spot.

Live juveniles from mangroves near Darwin, Northern Territory, with dull whitish yellow body with brownish black markings. Peritoneum silvery blue, dorsally blotched with dark brown. Light iridescent patch present on each side of chest, and similar blue pigment on lower pectoral fin rays and scattered across branchiostegal rays. First dorsal fin mainly black, translucent anteroventrally, with bright orange stripe through centre.

**Coloration of preserved material.** Head and body grey to light brown, lighter ventrally and sometimes posteriorly (Figs 3-4). Top and side of head indistinctly mottled with brown to greyish brown; usually most distinct markings being two brown streaks from front edge of eye to upper lip, areas between and on either side of streaks usually paler than surroundings. Black to dark brown line running along anteriormost edge

of opercle down and across branchiostegal membranes, becoming diffuse at isthmus; black line may be almost indistinguishable from brown mottling on head in heavily-pigmented specimens.

Six broad blackish to brown oblique bars crossing back and side, bars oriented anteriorly; first bar crossing nape in front of first dorsal fin and extending (diffusely) onto opercle, last bar beginning below uppermost few rays of caudal fin. Posteriormost bars often more distinct, due to contrasting lighter background. Bars sometimes pointed ventrally or partly broken up and interconnecting with interspersed mottled dark blotches or spots. At upper base of caudal fin, distinct round black spot present, surrounded by light brown or whitish; spot partly ocellate in many specimens. Below this spot, variably shaped blackish oblique blotch present; blotch forming spot, streak or ocellate curved black line. Belly and ventral part of body whitish or mottled with brown. Pectoral base with small black spot or short horizontal stripe near upper edge. Peritoneum dark brown, fading at lower sides toward belly.

First dorsal fin divided into three nearly equal bands: lowermost band dark grey to brown, central band narrowest, clear to





Fig. 3. *Hemigobius hoevenii*, female, 29 mm SL, ZRC 21872-21906, Singapore.

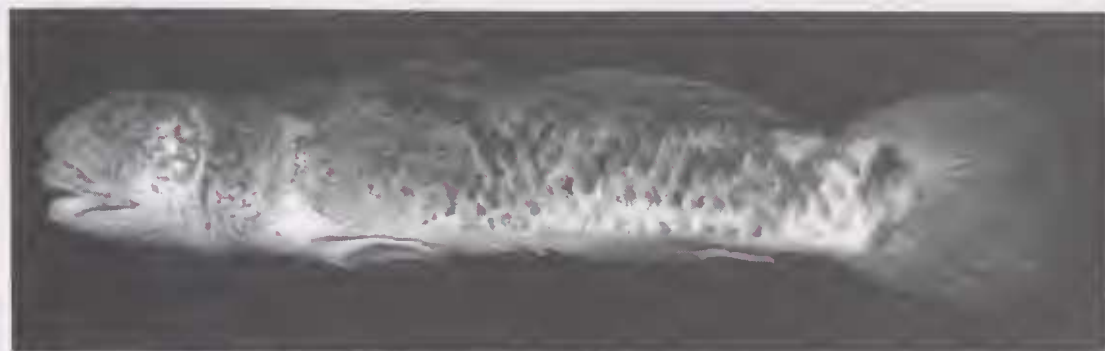


Fig. 4. *Hemigobius hoevenii*, male, 31 mm SL, NTM S.13968-008, Singapore.

whitish, outermost band usually dusky brownish, with tips of fin spines darkest. Lowermost band usually with black spot between fourth and sixth spines; sometimes second, poorly developed, black spot present near base of third spine. Second dorsal fin dusky, with broad white to translucent margin, and about three indistinct rows of short dark vertical blotches (blotches oriented along fin rays); uppermost row of blotches usually forming continuous dark edge just below white marginal band; blotches in lowermost row sometimes coalescing and forming three dark patches evenly spaced along fin base. Anal fin plain dark grey to brown, with broad white to translucent margin. Pectoral fin translucent to dusky, with blackish pigment along fin rays. Pelvics pale to dusky grey with broad whitish margin, fraenum whitish. Caudal fin mostly plain greyish, with two to three vertical curving dark bands behind ocellate black spot, irregular dark spots and streaks sometimes present; posteriormost edge of fin often whitish.

**Comparisons.** This species can be distinguished from the other known species in the genus, *H. mingi*, by having more pectoral rays (usually 15-16 versus 14 in *H. mingi*), the cheek below the eye being naked (versus two or three rows of scales below the eye), two dark bands, not forming a black spot, on the first dorsal fin (versus distinct black spot posteriorly), body shape (rather flat-headed and slender-bodied versus square-headed and deep-bodied) and in live colour.

This species superficially resembles a *Mugilogobius* (in its size, having a somewhat depressed head with rounded snout, similar body form and preference for shallow mangrove habitat), but can be distinguished by possessing headpores, 17 segmented caudal rays, a long coiled gut and a relatively small mouth with reduced lips.

**Distribution.** Specimens are known from Hong Kong, Borneo, Brunei, Sabah, Thailand, Singapore, the Philippines, Papua New Guinea and Northern Australia (Fig. 5).

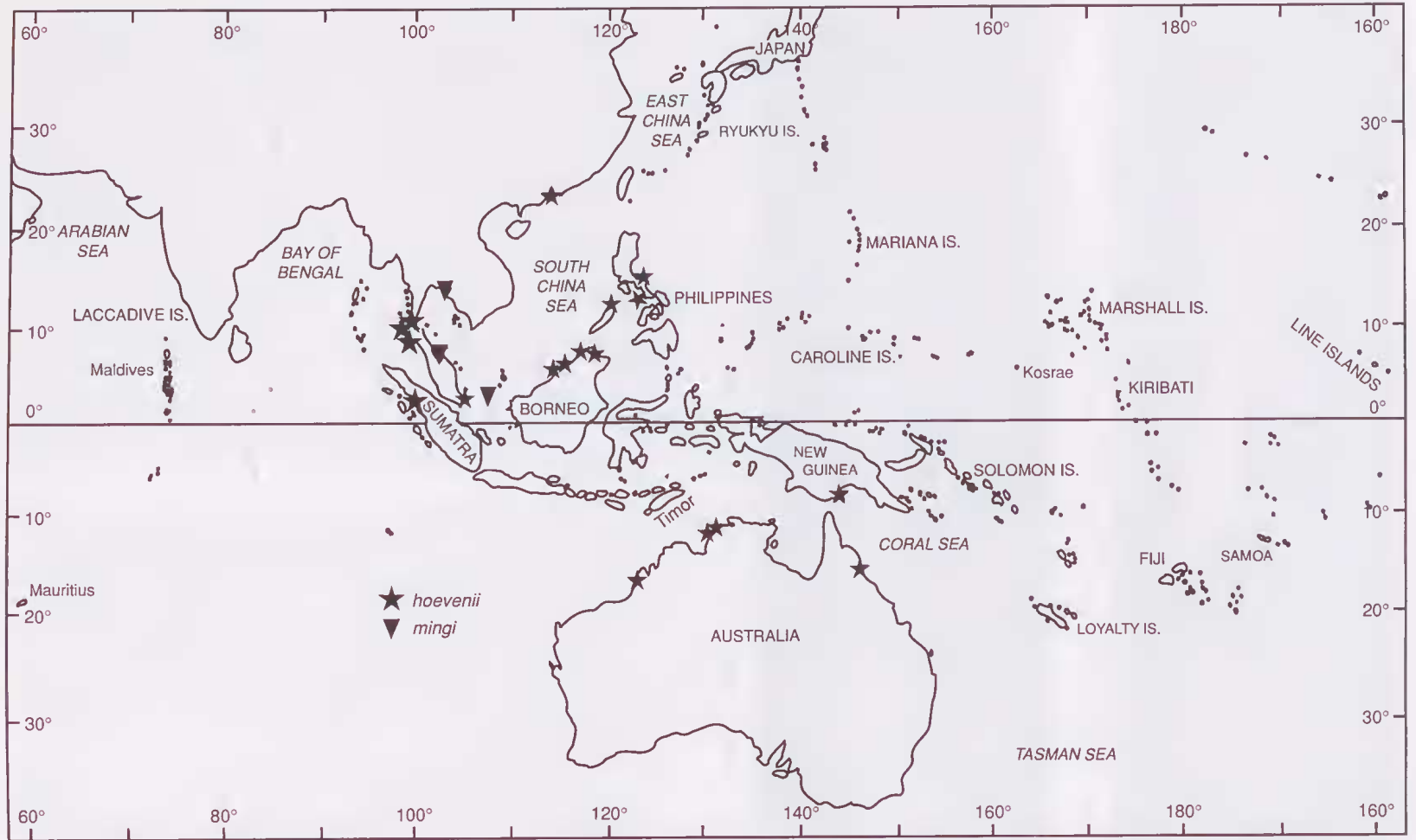


Fig. 5. Distribution of *Hemigobius* species.



Fig. 6. *Microgobius hoevenii* (= *Hemigobius hoevenii*), from Bleeker 1983: pl. 438, fig. 17. Courtesy of the Smithsonian Institution Press.

Zhu (1988: English Appendix, unpaginated) stated that this species "...is found in brackish water in the estuary of the Nandu River [China] and in freshwater of the Hainan Island". A colour slide sent by I-Shiung Chen (Bristol University) of a specimen he collected from Taiwan, confirms the species' occurrence at that island.

**Ecology.** *Hemigobius hoevenii* can be quite abundant in mangrove estuaries and streams. It is most easily observed in the shallows and in small isolated pools, where they lie concealed under leaf litter and detritus. Two specimens have been collected from *Nypa* palm leaf axils; the palms were fringing a flowing estuarine river.

Murphy (1990) reports that this species (as *Pseudogobius hoevenii*) feeds very close to the water's edge at low tide in Singapore mangroves and that he has observed a specimen captured by a large wolf-spider of the genus *Thalassius* (the goby was actually twice the body length of the spider).

**Remarks.** Bleeker's female holotype of *G. hoevenii* (RMNH 4457) is in very poor condition: the tail is broken, the jaws are missing and the skin from the top of the head and upper cheeks is missing. The bony grooves of the interorbital canals can be observed, and the counts and proportions agree with those of more recently-collected specimens. The small interorbital width given here for the holotype probably reflects the condition of the specimen, therefore the

interorbital width given is closer to the least bony interorbital width, not least fleshy width. Both Doug Hocse (AMS) and the author independently examined the holotype and obtained similar measurements.

RMNH 4457 is a little small (32 mm SL) for agreement with the type specimen in Bleeker's description. The type was given as 45 mm TL by Bleeker. The greatest caudal fin length obtained for a female was 7.7 mm, which would only bring the type to about 40 mm TL. The longest caudal fin was recorded for a 36 mm SL male (10.2 mm CL). Allowance should be made, however, for the missing jaws and damaged head of the type and the specimen is here accepted as being the holotype.

Bleeker's (1983) figure of *Microgobius hoevenii* (Fig. 6) shows the oblique dark bars of the species. Bleeker (1851) considered that *Gobius hoevenii* was related to *G. poicilosoma* (= *Pseudogobius poicilosomus*).

Koumans (1953: 125) confused this species with *Mugilogobius chuluae*, placing species belonging to *M. chuluae* in synonymy with *Stigmatogobius hoevenii* (= *Hemigobius hoevenii*). In his 1953 work, he describes the interorbital pores of *Hemigobius* but the colour pattern of *M. chuluae* (Koumans 1953: 125-126).

Type specimens of *Mugilogobius obliquifasciatus* Wu and Ni, 1985, were unavailable for study. However, the senior author of this species, Dr Wu of Shanghai University, confirmed via correspondence

**Table 5.** Measurements (mm) of *Hemigobius mingi* (Herre, 1936).

Character	Holotype	Males Minimum	Males Maximum	Males Mean n = 18	Females Minimum	Females Maximum	Females Mean n = 18
Head Length	10.6	4.3	11.5	8.2	4.6	12.0	9.7
Head Depth	6.9	2.7	8.9	5.6	3.0	8.6	6.5
Head Width	7.3	3.3	8.3	5.9	3.4	8.9	7.0
Body Depth	10.8	3.3	13.1	7.7	3.7	12.1	9.3
Body Width	-	1.7	6.8	4.1	3.6	7.8	5.6
Caud. Ped. Length	12.8	3.9	12.8	8.7	4.5	15.1	10.1
Caud. Ped. Depth	7.1	1.9	8.3	4.9	2.1	9.0	5.7
Snout	3.3	1.2	3.7	2.6	1.3	4.1	3.1
Eye	3.5	1.4	3.6	2.7	1.6	3.7	3.0
Jaw	3.0	1.3	3.7	2.6	1.6	3.8	3.0
Interorbit	4.9	1.9	5.2	3.8	2.3	6.1	4.4
Pectoral	7.8	2.8	8.0	5.7	4.5	9.7	6.8
Pelvic	6.7	2.5	8.1	5.2	2.8	7.8	5.9
Caudal	11.0	3.9	12.0	8.3	6.5	11.9	9.8
Longest DI spine	6.2	2.2	6.7	5.5	3.5	6.9	5.9

and photographs that the species was the same as *H. hoevenii*.

Herre's (1939) record of *Vaimosa hoeveni* (sic) from Middle Andaman Island probably refers to *M. chulae*. *Hemigobius hoevenii* has no more than 10 predorsal scales (Herre gives 13 predorsal scales for his Andaman specimen), while *M. chulae* has 11-15 scales.

Munro (1967), in a key, refers to a record of *Stigmatogobius hoeveni* from West New Guinea, which could be of *Hemigobius hoevenii*, *Mugilogobius chulae* or a currently undescribed *Mugilogobius* (Larson in press) (location of Munro's specimens unknown).

Chatterjee's (1980) record of *Stigmatogobius hoevenii* from West Bengal is probably not a *Hemigobius hoevenii* or a *Mugilogobius* species, but possibly a *Drombus*, as he illustrates the fish as having two transverse papillae rows on the cheek. Also, his predorsal scale count of 10-11 is little high for *H. hoevenii*. Unfortunately, Chatterjee did not give sufficient information to allow the reader to confidently identify the species from the text and drawings. It is unclear what he meant by the "nasal sensory canal-pores" illustrated in Figure 1B; they may be the large sensory papillae belonging to the nasal *c* series.

Nguyen's (1991) record of *Mugilogobius latifrons* from Ha Nam Ninh in Vietnam is accompanied by a drawing that is clearly of *H. hoevenii*.

### *Hemigobius mingi* (Herre, 1936)

(Figs 5, 7-12; Tables 1-3, 5)

*Gobius melanurus* Bleeker, 1849: 31 (Java) [not *Gobius melanurus* Gmelin]. - Günther 1961: 33.

*Hemigobius melanurus* - Koumans 1931: 78; - Bleeker 1983: pl. 433, fig. 9.

*Gnatholepis mingi* Herre, 1936: 8-9, pl. IV (Pulau Ubin, Singapore). - Fowler 1938: 266; - Koumans 1940: 151.

*Sphenentogobius vanderbilti* Fowler, 1940: 396-397, figs 8-11 (Medan, Sumatra). - Böhlke 1984: 111.

*Stigmatogobius mingi* - Koumans 1953: 118-119.

*Hemigobius bleekeri* Koumans, 1953: 191-192, fig. 47 (replacement name for *Gobius melanurus* Bleeker, 1849, not *Gobius melanurus* Bloch and Schneider, 1801). - Kottelat *et al.* 1993: 146, pl. 67.

**Material examined.** 68 specimens (11.3-55). INDONESIA: Lectotype of *Gobius melanurus* and *Hemigobius bleekeri*, RMNH 4501, 55 mm SL female, Java, in sea (Sunda Archipelago on jar label). Paralectotypes of *Gobius melanurus* and *Hemigobius bleekeri*, ex RMNH 4501, 2 (40.5-55), same data as lectotype. Holotype of *Sphenentogobius vanderbilti*, ANSP 68714, 40.5 mm female, Medan, Sumatra, Vanderbilt Expedition, 23 May 1939. SINGAPORE: Holotype of *Gnatholepis mingi*, CAS 30960, 43 mm SL

male, Pulau Ubin, A.W. Herre, 1934. ZRC 20263-72, 10(28-47), Sungai Punggol, 22 March 1966; ZRC 20192-37, 46(11.3-41.2), Sungei Punggol, C.K. Quek and M. Dali, 19 October 1965; CMK 8322, 2(39-41), Kranji mangroves near Sungei Buloh, M. Kottelat and D. Murphy, 8 April 1992; NTM S.14235-003, 4(14.5-22), Sungei Buloh mangroves, K. Lim, 30 January 1992; ZMH 19308, 2(26.5-35), aquarium import, Reichelt, 1 December 1090. THAILAND: URM P.6677, 4(33-40), Ranong, 9 March 1982; NTM S.14288-001, 1(46), in ponds within research station, Ta-Chaluab, Chantaburi Province, *Mahidolia* Project, NIFI, Chulalongkorn University and Mahidol University parties, 2 June 1990; KUMF unecatalogued, 1(40.5), Tak Bai canal, Narathiwat Province, D. Tanwilai, 25 September 1984; CMK 5419, 1(32.5), Ban Pliu, near Chantaburi, M. Kottelat, 21 March 1980. NO LOCALITY: RMNH 12580, 2(28-35.5).

*Other material examined (but not used in description).* 28 specimens, from the following localities. SINGAPORE: ZRC 30165-70, 6, Sungei Buloh East mangroves; NTM S.13961-006, 12, Mandai Kecil; NTM S.13957-008, 9, Sungei Pandan. THAILAND: USNM 316180, 1, Cheh Bilang, Satul, Satul Province.

**Diagnosis.** Deep bodied *Hemigobius*, with blunt head and compressed body; second dorsal rays 1,6-8 (modally 1,7); anal rays 1,6-7 (modally 1,7); pectoral rays 13-15; longitudinal scales 27-32; TRB 9-12; predorsal scales large, 8-10, edges often scalloped, extending close up behind eyes; body scales etenoid; side of lower jaw strongly curved upward, forming ridge at symphysis; first dorsal fin low, rounded, with no filamentous spines; body greyish to brownish, scales often with blackish centres and five to six white diagonal bars (very prominent in life), marbled or somewhat ocellate blackish spot on caudal base, eyes blue when live; known only from mangrove areas in Thailand, Singapore and Indonesia.

**Description.** Based on 36 specimens, 13.5-34 mm SL. Counts of holotype of *Gobius melamurus* indicated by asterisk.

First dorsal VI\*; second dorsal 1,6-1,8 (mean 1,7\*); anal 1,6-7 (mean 1,7\*); pectoral

rays 13-15 (mean 14; holotype with 15 on right, 14 on left); segmented caudal rays always 17\*; caudal ray pattern 6/6 to 9/8 (modally 8/7\*); branched caudal rays 12-17 (mean 15\*); unsegmented (procurent) caudal rays 6/7 to 8/8; longitudinal scale count 27-32\* (mean 29); TRB 9\*-12 (mean 10); predorsal scale count 8-10\* (mean 9); circumpeduncular scales 12\* or 13 (in one). Gill rakers on outer face of first arch 5+12 to 6+12 (modally 5+12). Dorsal pterygiophore formula 3-12210 (in 12). Vertebrae 10+16 (in nine), 10+17 (in one), 11+15 (in one), 11+16 (in one). Neural spine of first vertebra very short and broad, sharply bent posteriorly at halfway point (in 11). Two epurals (in 10) or one very broad epural (in two). Two (in two) or three (in 10) anal pterygiophores before haemal spine of first caudal vertebra. Lachrymal enlarged, almost square.

Body rounded anteriorly (especially in females); belly rounded and body compressed posteriorly in both sexes. Head square in cross-section, depth about equalling width; profile blunt to rounded; nape profile often curving behind flattened broad interorbital, HL 3.1-4.7 (mean 3.7) in SL. Depth at posterior preopercular margin 1.3-1.6 (mean 1.5) in HL. Width at posterior preopercular margin 1.3-1.6 (mean 1.4) in HL. Mouth small, subterminal, slightly oblique, with rounded snout overhanging upper lip; jaws forming angle of about 15-20° with body axis; jaws generally reaching to below anterior margin of eye in both sexes. Upper lip narrow, smooth, without fleshy fimbriae; lower lip reduced, narrow lip fold free at lower corner of jaw, rest of lip smoothly fused to underside of head; lower jaw curving upward and forming ridge at symphysis (resembling jaw of mugilid). Upper jaw 2.8-3.5 (mean 3.2) in HL. Eyes large, lateral, high on head, sometimes forming part of dorsal profile, 2.7-3.6 (mean 3.2) in HL. Snout bluntly rounded, and inflated over top lip, 2.8-3.6 (mean 3.2) in HL. Interorbital broad, flat, 1.8-4.1 (mean 2.3) in HL. Top of head above preopercular margin up to close behind posterior nostril often with fine villi, these relatively sparse on scales when compared with naked skin (villi often only visible in specimens with

well-preserved mucous coat; visible in holotype). Body usually quite round in abdominal region, especially in females, depth at anal origin 3.5-4.6 (mean 4.0) in SL. Caudal peduncle long, compressed, length 3.3-4.5 (mean 3.6) in SL. Caudal peduncle depth 5.5-7.3 (mean 6.4) in SL.

First dorsal fin low, rounded, tips of second to fourth spines free, second or third spines longest or subequal; spines always falling short of second dorsal origin when depressed. First dorsal spine usually shorter than next three. Second dorsal spine length 3.5-6.7 (mean 4.5) in SL. Third dorsal spine length 2.2-6.4 (mean 4.9) in SL. Fourth dorsal spine length 4.5-6.8 (mean 5.5) in SL. Second dorsal and anal fins low, posteriormost rays usually longer than anteriormost, rays only extending about half length of caudal peduncle when depressed. Pectoral fin small, short and rounded, central rays longest, 4.7-6.1 (mean 5.4) in SL; in adults, rays all branched but for lower and uppermost rays (uppermost ray or two usually unbranched). Pelvic fins short, rounded, reaching half (or less) distance to anus, 5.2-8.0 (mean 6.0) in SL. Caudal fin rounded, 3.4-5.0 (mean 3.8) in SL.

No mental fraenum, chin smooth. Anterior nostril in very short tube, placed just behind upper lip, tube oriented forward. Posterior nostril oval, with low rim, placed halfway between anterior margin of eye and edge of preorbital. Gill opening usually extending forward to just under opercle. Inner edge of shoulder girdle smooth with no ridge or flange (in 21) or with low bony ridge or flange (in 10). Gill rakers on outer face of first arch very short, pointed and without spines, longest two rakers on either side of angle of arch; tiny papillose flaps on pads above first arch; rakers on inner face of first arch more slender; outer rakers on other arches similar to those on first arch; inner rakers on other arches twice length of first arch inner rakers. Tongue tip usually blunt, or with tip concave in centre (almost bilobed in few specimens). Outer teeth in upper jaw very small, flattened, slightly curved, with pointed or somewhat spatulate tips (Fig. 7); behind this row, one or two rows of very small sharp teeth often partly concealed by flesh of mouth. Lower jaw with band of three to five rows of very

small pointed teeth, tooth band widest toward rear of jaw; teeth covering raised mandibular symphysis. No difference in teeth between males and females.

Predorsal scales medium to large, with largest scales anteriormost, scales reaching forward to close behind eyes; edge of predorsal scales usually crenulate or scalloped, most conspicuous in larger specimens. Operculum covered with cycloid scales. Cheek with two or three rows of cycloid scales; single row of scales below eye always present in adults, may be absent in specimens about 14 mm SL or less; often one or two scales on upper preopercle close behind eye. Pectoral base covered with cycloid scales. Prepelvic area covered with small cycloid scales. Belly scales ctenoid; few small cycloid scales around anus sometimes present. Body scales ctenoid up to pectoral base, ctenoid scales sometimes extending above posterior part of opercle.

Genital papilla in female short, conical and rather pointed, slightly flattened toward tip; papilla in male slender, flattened and pointed to slightly rounded at tip; may be short or elongate (up to half length of anal fin spine).

Head pores present, in reduced pattern (Fig. 8). Anterior and posterior interorbital pores paired; latter pair of pores never joined by canal, always separate. Postorbital and infraorbital pores present. No preopercular pores. No oculoscapular canal over preoperculum. In small (juvenile) specimens, anterior interorbital pores may be absent.

Sensory papillae pattern longitudinal, as in Figure 8. Papilla row *p* consisting of widely spaced papillae; row largely replaced by interorbital canal. Cheek papillae rows short, interrupted by scale rows on cheek; papillae rows rather broken-up, scattered, rows *a*, *cp* and *c* composed of few large papillae; rows *b* and *d* short, composed of small, close-set papillae. Three *s* rows present on snout, consisting of one or two papillae each. Single *f* row papilla on each side of mandibular symphysis, behind lip.

**Coloration of fresh material.** A dead specimen is shown in Kottelat *et al.* (1993: 146, pl. 67), and a coloured illustration in

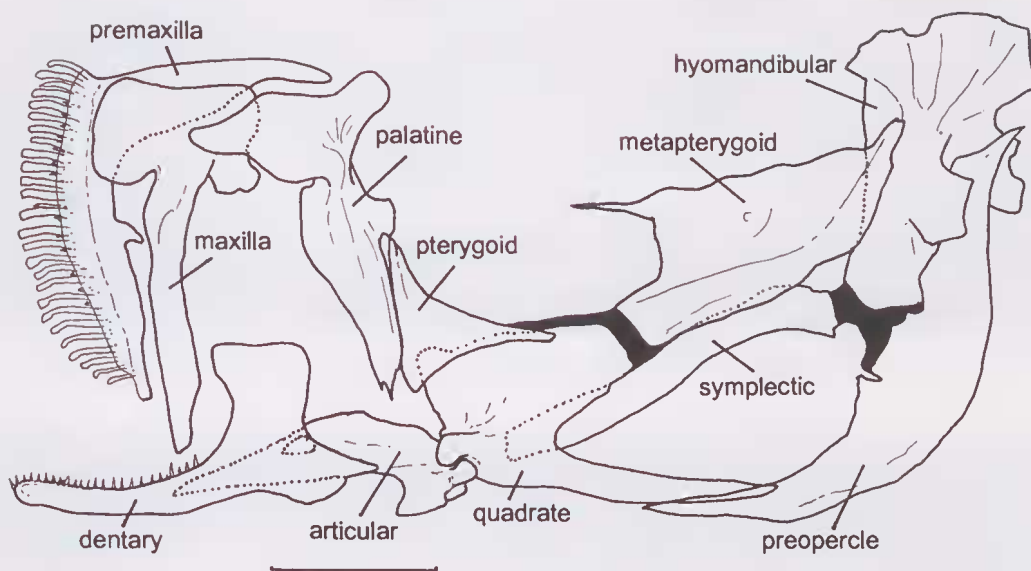


Fig. 7. Jaws and suspensorium of *Hemigobius mingi*, female, ex URM P.6677, Ranong, Thailand. Scale bar = 1 mm. Black areas are cartilage.

Bleeker (1983: pl. 433, fig. 9). The living fish are considerably more conspicuous. Notes taken by the author, from living Singapore specimens, follow.

Head and body yellowish brown with pale yellowish to whitish yellow bars alternating with dark brownish bars on side of body. Body bars most clearly defined in young fish; pale bars appear wider in young. Area around dark spot at base of caudal slightly more intensely yellow than yellowish (pale) body bars. Juveniles and specimens up to about 25 mm with three bright blue-white to whitish yellow or white bars across top of nape, beginning not far behind eyes, bars can be irregular or asymmetric in shape; anteriormost bar often rounded, forming conspicuous blotch or spot. Underside of head silver, silvery blue or deep blue; blue sometimes extending up onto cheek, opercle and pectoral base. All fish with distinctive pale blue eyes; blue visible when viewed from above. Inside of lips and mouth golden yellow to brownish yellow.

First dorsal fin with dense black spot occupying rear half of fin; anterior half of fin bright orange. Second dorsal and anal fins pinkish to yellow with darker brownish

markings. Caudal fin greyish to pinkish with grey vertical banding and spotting. Juveniles with most intense fin colours.

**Coloration of preserved material.** Head and body dark grey to light brown, usually paler on lower abdomen and belly. Most scales with darker spot near centre; often giving appearance of indistinct thin lines midlaterally. Six variably oblique white bars present, crossing dorsal midline (most distinct in well-preserved fresh specimens): first bar crossing above opercle, second bar below first dorsal fin, third at gap between dorsals, fourth at midpoint of second dorsal, fifth across caudal peduncle and sixth (vertical) crossing caudal base (Figs 9-11). Bars breaking up laterally, with anteriormost bar often absent in larger specimens. At caudal base behind white bar, black spot on upper half of base or vertically paired black spots usually visible; spot diffuse in large adults, intense black in juveniles. Top and sides of head dark grey, sometimes mottled, but without any distinct pattern. Juvenile specimens often with one or more white spots on anteriormost predorsal scale. Peritoneum dull brownish, darkest dorsally, fading toward pale belly.

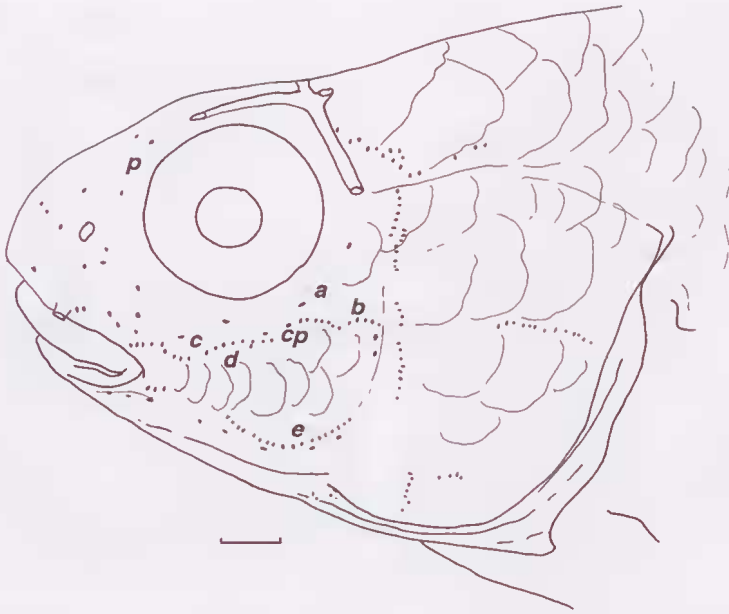


Fig. 8. *Hemigobius mingi*, headpores and papillae pattern. ZRC 20263-72, Sungei Punggol, Singapore. Scale bar = 1 mm.

First dorsal fin with distal half whitish to translucent, with narrow black to brown margin; proximal half dusky to brown with large black spot posteriorly, occupying space between third or fourth spines and rear of fin. Second dorsal fin translucent whitish, with three indistinct dusky stripes; stripes often broken up into series of vertically aligned oval brown to blackish spots, although uppermost stripe usually present as continuous stripe; fin margin translucent whitish. Anal fin dusky, translucent proximally and at anterior base of first few fin rays. Caudal fin dark grey to brown, with about six or seven vertical rows of small spots and short streaks. Pectorals clear to whitish, fin rays with very narrow blackish edges. Pelvics plain light brown to whitish.

**Comparisons.** Characters distinguishing this species from the only other known species in the genus, *H. hoevenii*, are given under Comparisons for that species. *Hemigobius mingi* has an autapomorphy in the shape of the lachrymal, which is quite large for this group of fishes, and almost square.

**Distribution.** Specimens are known from Singapore, Thailand, Sumatra and Java

(Fig. 5). The species has recently been collected by the author from Brunei (Bandar Seri Begawan, Tutong, Kuala Belait), but the material was not available to include in this study.

**Ecology.** In Singapore, this species is common in muddy mangrove pools back from the main tidal flow, especially among *Rhizophora* thickets. The behaviour of *Hemigobius mingi* is interesting in that the fish hover above the substrate in an almost vertical posture, in small groups, with the bright silvery-white bars across the dorsal surface making the fish quite conspicuous against the dark background. This behaviour is unusual in that many mangrove gobies conceal themselves under leaf litter or in holes, with the conspicuously marked *Brachygobius* and *Pandaka* being exceptions. The anteriormost spot (or bar) in this species is reminiscent of that visible in the ricefishes (*Oryzias*) which are syntopic with *Hemigobius* in the Indo-Malayan Archipelago.

It is apparently fairly tolerant of poor conditions, as some specimens collected in Singapore (Mandai Kecil) came from pools in which the substrate consisted mostly of





Fig. 9. *Hemigobius mingi*. Holotype of *Gnatholepis mingi* Herre, 44 mm SL, CAS 30960, Pulau Ubin, Singapore.

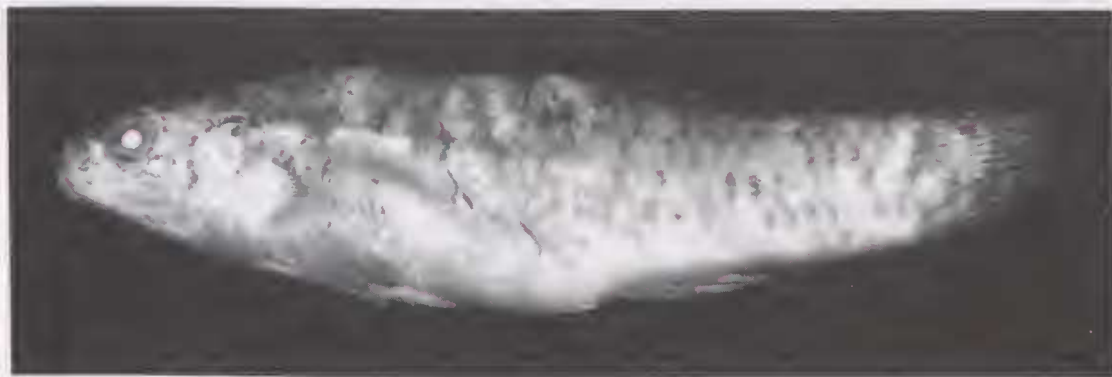


Fig. 10. *Hemigobius mingi*. Holotype of *Sphenentogobius vanderbilti* Fowler, 42.5 mm SL, ANSP 68714, Medan, Sumatra.



Fig. 11. *Hemigobius mingi*, male, 40 mm SL, one of ZRC 20263-20272, Sungai Punggol, Singapore.

mud and rotting garbage (although it must be admitted that the *Hemigobius* and other gobies present appeared temporarily stunned by the gases released from beneath the substrate as the author moved about the pools dipnetting fish).

**Remarks.** Koumans (1953) created the name *bleekeri* as a replacement name for *Gobius melanurus* Bleeker “not *Gobius melanurus* Broussonet – not *Gobius melanuros* Gmelin in Linnaeus ... not *Gobius melanurus* Bl. Schn. ...”. This was an



Fig. 12. *Hemigobius mingi*, from Bleeker 1849 (pl. 433, fig. 9). Courtesy of the Smithsonian Institution Press.

unnecessary replacement, as is outlined below.

Broussonet (1782), at the end of his description of *Gobius ocellaris*, listed four sets of gobioid groups and a character distinguishing each group from *Gobius ocellaris*. Here he gave the name *Gobius melanuro* and a character “*pinnis dorsalibus duabus*”. The character of “two dorsal fins” was provided to distinguish *G. ocellaris* from *Gobius anguillaris* and *Gobius melanuro* by its possessing two dorsal fins, implying that the latter two species have one fin. *Gobius anguillaris* and *G. melanuros* are not distinguished from each other by any statement. Therefore the name *melanuro* Broussonet is not available as no description exists. Eschmeyer (1998) stated the name *Gobius melanuro* Broussonet, 1782, as not available (no distinguishing features).

Gmelin’s (1789) use of the name *Gobius melanuros* constitutes a description, as he lists two characters (single dorsal fin, black caudal fin), therefore that name is available. Lacepède (1800) correctly latinized the Greek *-os* to *-us* when he used the emended name *melanurus*, and he placed the species in the genus *Gobioides* (along with three other species). Bloch and Schneider (1801) also referred to Gmelin’s name and corrected the spelling to *Gobius melanurus*.

Bleeker (1849) created the name *Gobius melanurus* for his species from Java, without reference to Broussonet or Gmelin. Bleeker’s name is thus a primary homonym of Gmelin’s emended *Gobius melanurus*, the first available name. The next available

name for the taxon is *Gnatholepis mingi* Herre, 1936.

It is uncertain as to what the species *melanurus* of Gmelin and Lacepède actually is (described as “*pinna dorsali unica, cauda nigra*” by Gmelin). Richardson (1846) referred to specimens from Canton, China, as *Gobioides melanurus* (after Broussonet manuscript and figure). No specimens are known, and Richardson’s description is based on a drawing and notes, which indicate that the fish had a pointed tail, a black spot on the base of the fin and one dorsal fin (Richardson 1846). It is possible that *Gobioides melanurus* is an amblyopine, or even a channid.

Miller (1987) referred to the holotype of *Hemigobius bleekeri* Koumans as being RMNH 4501, a 40 mm SL (“40+8”) female. Koumans (1953) stated “Types seen”, but did not designate a type of *H. bleekeri*, nor is there any indication in the specimen jar as to which specimens he considered to be types. In 1988, RMNH 4501 consisted of three possible syntype specimens, 40.5–55.0 mm SL, of which the largest and smallest are female. In the original description, Bleeker (1849) wrote “33 millimetr”, that is, 33 mm TL, which would make these types of *melanurus* (and *bleekeri*) rather larger than he described (he did not indicate how many specimens he had). The description may have been based on a male, as Bleeker wrote: “. . . *appendice anali conica acuta.*.”; however, this description could equally apply to some female specimens. The figure given in Bleeker of *Hemigobius melanurus*

(1988: pl. 433, fig. 9) (Fig. 12), drawn life-sized, is of a 55 mm SL fish, probably the large female in RMNH 4501. In the interests of stability, this 55 mm SL female specimen (RMNH 4501) is here designated as lectotype of *Gobius melanurus* Bleeker and *Hemigobius bleekeri* Koumans.

#### ACKNOWLEDGMENTS

My thanks to curators and staff at the institutions who loaned specimens, especially Jerry Allen, WAM; Genie Böhlke, ANSP; Dave Catania, CAS; Bill Eschmeyer, CAS; Doug Hoese, AMS; Susan Jewett, USNM; Maurice Kottelat, CMK; (previously at ZSM); Kelvin Lim, ZRC; Mark McGrouther, AMS; Nigel Merrett, BMNH; Peter Ng, ZRC; Martien van Oijen, RMNH; Chavalit Vidthayanon, NIFI; H. Wilkens, ZMH; Prachit Wongrat, KUMF; Thosaporn Wongratana, Chulalongkorn University, Bangkok; Tetsuo Yoshino, URM.

Many thanks to those people who helped provide fresh specimens or information: I-Shiung Chen, Bristol University; Satish Choy, formerly of University of Brunei; Russell Hanley, formerly of NTM; Ukkrit Satapoomin, Biological Research Centre, Phuket; Dave Wilson, Territory Wildlife Park, Darwin; Dr Wu Han-ling, Shanghai University.

My thanks to Tony Gill, BMNH, for his useful comments on versions on this manuscript. And many thanks also to Rex Williams, NTM technical officer, for his black and white photography and map preparation.

#### REFERENCES

Anon. (Pearl River Fisheries Research Institute, Shanghai Fisheries University, East China Sea Fisheries Research Institute, Fisheries School of Guangdong Province). 1986. *The freshwater and estuaries fishes of Hainan Island*. Guangdong Science and Technology Press: Guangzhou (in Chinese).

Aurich, H.J. 1938. Mitteilug XXVIII der Wallacea-Expedition Woltereck. Die Gobiiden. (Ordnung: Gobioida). *Internationale Revue*

*der gesamten Hydrobiologie und Hydrographie* 38(1/2): 125-183.

Birdsong, R.S., Murdy, E.O. and Pezold, F.L. 1988. A study of the vertebral column and median fin osteology in gobioid fishes with comments on gobioid relationships. *Bulletin of Marine Science* 42(2): 174-214.

Bleeker, P. 1849. Bijdrage tot de kennis der Blennioïden en Gobioiden van den Soenda-Molukschen Archipel, met beschrijving van 42 nieuwe soorten. *Verhandelingen van het Bataviaasch Genootschap van kunsten en wetenschappen* 22(6): 1-40.

Bleeker, P. 1851. Vijfde bijdrage tot de kennis der ichthyologische fauna van Borneo met beschrijving van eenige nieuwe soorten van zoetwatervisschen. *Natuurkundig Tijdschrift voor Nederlandsch-Indie* 2: 415-442.

Bleeker, P. 1854. Ichthyologische waaremingen gedaan op verschillende reizen in de residentie Bantam. *Natuurkundig Tijdschrift voor Nederlandsch-Indie* 7: 309-326.

Bleeker, P. 1874. Esquisse d'un système naturel des Gobioides. *Archives Néerlandaises des Sciences exactes et naturelles* 9: 289-331.

Bleeker, P. 1983. *Atlas Ichthyologique des Indes Orientales Néerlandaises, par M.- P. Bleeker. (Plates originally planned for planned tomes XI-XIV published here for the first time)*. Smithsonian Institution Press: Washington.

Bloch, M.E. and Schneider, J.G. 1801. *Systema Ichthyologiae. Iconibus ex Illustratum. Post Obitum Auctoris Opus Inchoatum Absolutum. Correxit, Interpolavit Jo. Gottlob Schneider*. Berlin. Facsimile, Cramer and Swann: Codicote.

Broussonet, P.M.A. 1782. *Ichthyologia sistens piscium descriptions et icones*. Emsley: London.

Chatterjee, T.K. 1980. Record of *Stigmatogobius hoevenii* (Bleeker) from the Gangetic Delta, west Bengal, with a key to the Indian species of *Stigmatogobius*. *Bulletin of the Zoological Survey of India* 2(2&3): 229-231.

Davis, T.L.O. 1988. Temporal changes in the fish fauna entering a tidal swamp system in tropical Australia. *Environmental Biology of Fishes* 21(3): 161-172.

Eschmeyer, W.N. (ed.). 1998. *Catalog of fishes*. California Academy of Sciences: San Francisco.

Fowler, H.W. 1940. Zoological results of the George Vanderbilt Sumatran Expedition, 1936-1939. Part II - The fishes. *Proceedings of the*

- Academy of Natural Sciences of Philadelphia* **91**: 369-398.
- Geevarghese, C. 1983. Morphology of the alimentary tract in relation to diet among gobioid fishes. *Journal of Natural History* **17**: 731-741.
- Gmelin, J.F. 1789. Pisces. In: Caroli a Linné (ed.) *Systema naturae* 13th edition, 1(3). Leiden.
- Günther, A. 1861. *Catalogue of the acanthopterygian fishes in the collection of the British Museum*. Vol. III. Pp. 1-153. London : British Museum.
- Herre, A.W.C.T. 1936. Eleven new fishes from the Malay Peninsula. *Bulletin of the Raffles Museum, Singapore* **12**: 5-16.
- Herre, A.W.C.T. 1939. On a collection of littoral and freshwater fishes from the Andaman Islands. *Records of the Indian Museum* **41**: 327-372.
- Herre, A.W.C.T. 1945. Notes on fishes in the Zoological Museum of Stanford University: XX, New fishes from China and India, a new genus, and a new Indian record. *Journal of the Washington Academy of Sciences* **35**(12): 400-404.
- Hubbs, C.L. and Lagler, K.F. 1958. *Fishes of the Great Lakes Region*. University of Michigan Press: Ann Arbor.
- Kottelat, M., Whitten, A.J., with Kartikasari, S.N. and Wirjoatmodjo, S. 1993. *Freshwater fishes of Western Indonesia and Sulawesi*. Periplus Editions Ltd: Indonesia.
- Koumans, F.P. 1931. A preliminary revision of the genera of the gobioid fishes with united ventral fins. *Proefschrift Drukkerij Imperator N.V. Lisse*: 1-174.
- Koumans, F.P. 1953. X. Gobioida. In: Weber, M. and Beaufort, L.F. de. (eds). *The Fishes of the Indo-Australian Archipelago*. E.J. Brill: Leiden.
- Lacepède, B.G.E. 1800. *Histoire naturelle des poissons*. Volume 2. Chez Plassan: Paris.
- Larson, H.K. 1995. A review of the Australian endemic gobioid fish genus *Chlamydogobius*, with description of five new species. *The Beagle, Records of the Museums and Art Galleries of the Northern Territory* **12**: 19-51.
- Larson, H.K. In press. A revision of the gobioid fish genus *Mugilogobius* (Teleostei: Gobioidae), with discussion of its systematic placement. *Records of the Western Australian Museum, Supplement*.
- Miller, P.J. 1987. Affinities, origin and adaptive features of the Australian desert goby *Chlamydogobius eremius* (Zietz, 1896) (Teleostei: Gobiidae). *Journal of Natural History* **21**: 687-705.
- Miller, P.J. 1989. The classification of bumble-bee gobies (*Brachygobius* and associated genera) (Teleostei: Gobiidae). *Cybium* **13**(4): 375-383.
- Munro, I.S.R. 1967. *The fishes of New Guinea*. Department of Agriculture, Stock and Fisheries: Port Moresby.
- Murphy, D.H. 1990. "Walkers on water" - an account of the pleuston of Singapore. In: Ming, C.L. and Ng, P.K.L. (eds) *Essays in Zoology. Papers commemorating the 40th anniversary of the Department of Zoology, National University of Singapore*. National University of Singapore.
- Nguyen, N. T. 1991. *Ca bien Viet Nam. Ca xuong vinh bac bo*. Nha Xuat Ban Khoa Hoc Va Ky Thuat: Hanoi. (= *Marine fishes of coastal Viet Nam*. In Vietnamese).
- Richardson, J. 1846. Report on the ichthyology of the seas of China and Japan. *Report of the British Association for the Advancement of Science, 15th Meeting* [1845]: 187-320.
- Sanzo, L. 1911. Distribuzione delle papille cutanee (organi ciatiformi) e suo valore sistematico nei Gobi. *Mitteilungen aus der Zoologischen Station zu Neapel* **20**: 249-328.
- Wu, Hanling and Ni, Y. 1985. On two new species of *Mugilogobius* Smitt (Perciformes: Gobiidae) from China. *Zoological Research* **6**(4): 93-98 (in Chinese).
- Zhu, K.-C. (ed.). 1988. *The freshwater fishes of China in coloured illustrations. Part 2*. Science and Technology Press: Shanghai (in Chinese).

Accepted 28 February 1999